

# 350INVCH150-120-240-xG INVERTER CHARGER



The Bel Power Solutions **350INVCH150-120-240-xG** is a 15 kW inverter charger that converts AC to DC voltages in charge Mode and converts DC voltages to pure sine wave AC to power AC accessories. The liquid cooled inverter charger operates at 250-435 VDC and 120/240 VAC (50/60 Hz) split-phase.

The inverter charger powers up to 15 kW in either direction. Features include very high efficiency, high reliability, low total harmonic distortion (AC), low output voltage noise (DC), and excellent dynamic response to load/input changes.

## Key Features & Benefits

- Up to 15KW Power in Charge and Export Mode
- 90 % Typical Efficiency
- Charge Mode Output 250-435 VDC
- Export Power Mode Output 120/240VAC-50/60 Hz
- J1939 Compliant CAN Control and Monitoring
- Over-temperature, Output Over-voltage and Over-current Protection
- SAE 1455 Complaint Environmental Standards
- IP65 and IP67 Rating

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# 350INVCH150-120-240-xG

## Model Selection

MODEL	DESCRIPTION
350INVCH150-120-240-8G	Inverter Charger
350INVCH150-CON-KIT-8G	Connector Kit with 3m long HV DC cable attached to DC matting connector
350INVCH150-CON-KIT-9G	Connector Kit including DC matting connector but without HV DC cable

## TECHNICAL DATA

### Charge Mode Input

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Input Voltage	Nominal Operating Range	100	230	240	VAC
	Absolute Operating Range	90		264	
Input Current	Charge Mode:			70	Arms
		@ 195 – 265 VAC		16	
	@ 90 – 195 VAC				
Frequency		47	50 / 60	63	Hz
Input Line Under-voltage	Charge Mode: Inverter Shutdown	83	85	88	VAC
Input Capacitance				100	μF
Leakage Current	@ 265 VAC, 60 Hz			10	mA
Line Harmonic Current	EN 61000-3-12				
Inrush Current	Pre-charge Mechanism				
Power Factor	@ Vin = 240 VAC, Poset = 250 VDC*40 ADC and 435 VDC*34 ADC	0.98			

### Charge Mode Output

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Output Type	DC current source with 120 Hz sine wave ripple component				
Output Voltage	Not regulated; depends on battery voltage	250	375	435	VDC
Output Current	Average output current adjustable via CAN			40	ADC
Output Power	@ 240 VAC / 250 VDC			10	kW
	@ 240 VAC / >375 VDC			15	
Efficiency	@ Vin = 240 VAC, Vo = 375 VDC Io = 40 ADC	88	90		%
Static Regulation	Charge Mode: Set Point Accuracy @ Idcset = 30 A, Load in voltage Mode, Tcoolant = 25°C Thermal Drift after 15 min warm up period	- 1		+ 1	ADC
		- 0.05		+ 0.05	%/°C
Turn-On/Off Delay	Charge Mode: Turn-On Delay			3	s
				1	
	Turn-Off Delay				

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## Export Mode Input

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Input Voltage		250	375	435	VDC
Input Current	Average Input current			40	ADC
Input Line Under-voltage	Export Mode: Inverter shutdown			240	VDC
Inrush Current	External pre-charging circuit is required as part of battery management system.				
Input Capacitance				400	μF

## Export Mode Output

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Output Voltage	Split-phase 120 / 240 VAC	2x 112	2x 120	2x 128	VAC
Output Current	Export Mode: Phase - L1, L2 Neutral - N			60 40	Arms
Output Power	@ >375 VDC / 240 VAC			14.4	kVA
Frequency	CAN selectable 50 or 60 Hz Mode: 50 Hz Mode: 60 Hz	49.9 59.9	50 60	50.1 60.1	Hz
Efficiency	@ 250 VDC, 435 VDC, IAC1 = IAC2 = 60 Arms	88	90		%
Load Regulation	Export Mode: @ 250 VDC, 435 VDC	- 8	0	+ 8	VAC
Load Step Response	Load step 30 Arms IAC1 = IAC2 Minimum IAC1 = IAC2 = 6 Arms Voltage deviation Response time	- 30%	0	+ 30% 4	VAC ms
Periodic and Random Deviation	Export Mode: @ 120 VAC / 60 Arms	- 3.5		+ 3.5	Vpk
Total Harmonic Distortion	@ 250, 435 VDC; Load 0 – 60 Arms			3	%
GFCI	Leakage current threshold @ 120 VAC, 60 Hz Reaction time		25	30 30	mA ms
Turn-On/Off Delay	Export Mode: Turn-On Delay Turn-Off Delay			3 1	s

## Protection

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Output Over-Current Protection	Export Mode: 10s Over-Load Phase - L1, L2 Neutral - N			120 60	Arms
Short Circuit Survival - Operating	Self-protecting; Hiccup mode				
Output Over-Voltage Protection	Charge Mode: Latch type, CAN adjustable, max. OV Duration 1ms Export Mode: Latch type, max. OV Duration 8.33 ms	250		435	VDC VAC
Output Under-Voltage Protection	Charge Mode: Latch type, CAN adjustable, max. UV Duration 1.0 s Export Mode: UV Duration 1.0 s	250		435	VDC VAC
Over-Temperature Protection	Converter shutdown at T_coolant higher than	65			°C
Input Overvoltage Protection	Charge Mode: Export Mode:	272 432		288 448	VAC VDC

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## Converter Control Signals

PARAMETER	DESCRIPTION / CONDITION
IGN (Key Switch)	CAN communication enable Level High = Enable
Control Pilot	Function and levels according to SAE J1772
Proximity Detection	Function and levels according to SAE J1772
LED1	PWM current source max 50mA. Supplied from battery voltage input (VBAT 12V) PWM controlled with CAN bus.
LED2	PWM current source max 50mA. Supplied from battery voltage input (VBAT 12V) PWM controlled with CAN bus.
VBAT	12V battery voltage input. Used to supply CAN bus communication
EVSE_WAKE_OUT	Energy taken from VBAT. Voltage level is approximately 1.5V below connected VBAT. High side output wake VCU and other vehicle control modules and/or relay coils. Wake output goes high when control pilot is active and goes low when CAN command from VCU is received or in sleep Mode.
LCD_SCL / LCD_SDA	I <sup>2</sup> C for communication with display; 5V logic level; max 100kHz
GFCI_LED	PWM current source max 50mA for supply of LED (GFCI status)
GFCI_RST	If signal is pulled up to 12V for >5ms GFCI will reset
CAN_BAUD_RATE	CAN bus speed; Open – 500 kBit / Grounded – 250 kbit

## Safety, Regulatory and EMC Specifications

PARAMETER	DESCRIPTION / CONDITION	CRITERION
Insulation	Signals to AC	Basic 2250 VDC
	Signals to DC	Basic 2500 VDC
	AC to DC	Reinforced 2500 VDC
	Signals RTN to PE	Electrically connected *
Radiated Emission	FCC15	Class A
Conducted Emission	FCC15, CISPR 22, EN 55022	Class A
Electrostatic Discharge	IEC 61000-4-2	Performance Criterion B
Radiated Electromagnetic Field	IEC 61000-4-3, SAE J1113/21	Performance Criterion B, Status 2
Electrical Fast Transient (EFT) /Burst	IEC 61000-4-4; Level 2 (+/- 2 kV, 5 kHz)	Performance Criterion B
Surge Immunity	IEC 61000-4-5; Level 3 surge (+/- 1 kV DM and +/- 2 kV CM)	Performance Criterion B
RF Conducted Immunity	IEC1000-4-6; Level 3 (10V, 0.15...80 MHz, AM 80%, 1 KHz)	Performance Criterion A
Flicker Tests	IEC 61000-3-3	
Electrical Transient Conduction along Supply Lines	ISO 7637-2, ISO 16750-2	

\* Due to referencing of Control Pilot and Proximity against PE/chassis (SAE J1772)

## Environmental Specifications

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Altitude	Non-Operating: 18.6 kPa absolute pressure			12200	m
Operating Temperature	Liquid cooled:				
	T_coolant with power derating	-40		+60	°C
	(100% Full Power @ +50°C; 90% Full Power @ +60°C)				
Storage Temperature	T_ambient @ full load, with no power derating	-40		+85	
		-40		+95	°C
Humidity	SAE J1455				
Shock	SAE J1455, GMW-3172				
Vibration	SAE J1455, GMW-3172				
Protection	IP65 and IP67 / when all mating connectors are installed				

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# 350INVCH150-120-240-xG

## Connectors

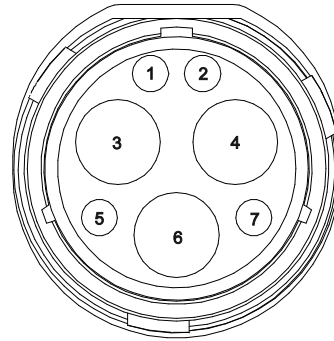
PARAMETER	DESCRIPTION / CONDITION	MANUFACTURER	MPN
AC Input Connector	Inverter Charger side	MFG: Deutsch	HDP24-24-7PN-C038
	Mating connector	MFG: Deutsch	HDP26-24-7SN-C038
AC Output Connector	Inverter Charger side	MFG: Deutsch	HDP24-24-9SE
	Mating connector	MFG: Deutsch	HDP26-24-9PE-L015
DC Power Connector*	Inverter Charger side	MFG: TE Connectivity	1-2141272-1 (HVA-630)
	Mating connector	MFG: TE Connectivity	2177140-3
Signal Connector 1	Inverter Charger side	MFG: TE Connectivity	776087-5
	Mating connector	MFG: TE Connectivity	770680-5
Signal Connector 2	Inverter Charger side	MFG: TE Connectivity	776087-1
	Mating connector	MFG: TE Connectivity	770680-1

\* HVIL\_In and HVIL\_OUT signals are connected directly to SIGNAL 2 connector. Signals are insulated from HV DC side. Signals are insulated from 12V\_RTN up to 60 VDC basic insulation.

### AC INPUT CONNECTOR

PIN	FUNCTION
1	Control Pilot*
2	Proximity*
3	L1 - Input
4	L2 or N - Input
5	Not Used
6	PE
7	Not Used

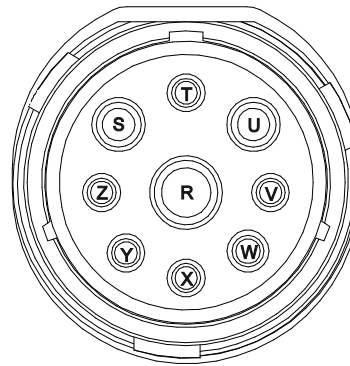
\* Functions and levels according SAE J1772;  
Insulated from AC side;  
Referenced to 12V\_RTN



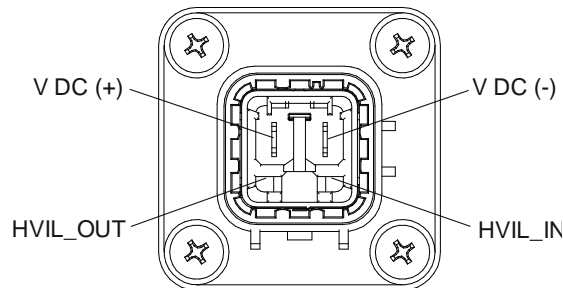
### AC OUTPUT CONNECTOR

PIN	FUNCTION
R	N - Output
S	L1 - Output
T	PE*
U	L2 - Output
V	PE*
W	PE*
X	PE*
Y	PE*
Z	PE*

\* All PE terminals (T, V, W, X, Y, Z) shall be connected together to keep safety rating requirements.



### DC INPUT / OUTPUT CONNECTOR

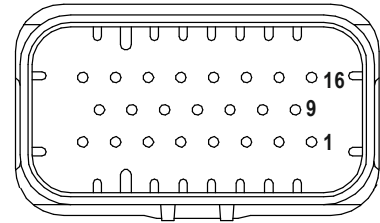


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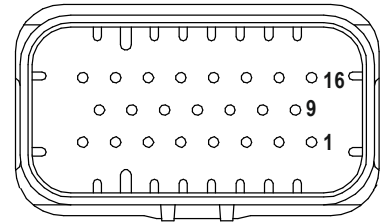
## SIGNAL 1

PIN	NAME	FUNCTION	AMPS PER PIN
1	LCD_SCL	I <sup>2</sup> C SCL for Display	2 (AWG20)
2	LCD_SDA	I <sup>2</sup> C SDA for Display	2 (AWG20)
3	GFCI_LED	GFCI status signal	2 (AWG20)
4	GFCI_RST	Pin to connect external GFCI reset button (Button connected to +12V)	2 (AWG20)
5	12V_BAT	Connected to connector 2 pin 3	2 (AWG20)
6	12V_RTN	Return for 12V battery and signals Connected with connector 2 pin 10	2 (AWG20)
7	SWITCH_IN	Loop to connector 2 pin 14	2 (AWG20)
8	ALARM_OUT	Loop from connector 2 pin 13	2 (AWG20)
9	IGN	Loop from connector 2 pin 12	2 (AWG20)
10 - 23	NA		



## SIGNAL 2

PIN	NAME	FUNCTION	AMPS PER PIN
1	LED_1	Charger status LED1	2 (AWG20)
2	LED_2	Charger status LED2	2 (AWG20)
3	VBAT	12V battery voltage input	2 (AWG20)
4	CANH_1	CAN Bus H	2 (AWG20)
5	CANL_1	CAN Bus L	2 (AWG20)
6	HVIL_1	HVIL from DC connector (HVIL_IN)	2 (AWG20)
7	HVIL_2	HVIL from DC connector (HVIL_OUT)	2 (AWG20)
8	CANH_2	CAN Bus H (connected to pin 4)	2 (AWG20)
9	CANL_2	CAN Bus L (connected to pin 5)	2 (AWG20)
10	12V_RTN	Return for 12V battery and signals	2 (AWG20)
11	EVSE_WAKE_OUT	Signal to wake up Vehicle Control Unit (VCU module)	2 (AWG20)
12	IGN	(Key Switch) Supply of CAN and Bias convertor enable.	2 (AWG20)
13	ALARM_IN	Loop to connector 1 pin 8	2 (AWG20)
14	SWITCH_OUT	Loop from connector 1 pin 7	2 (AWG20)
15	EVSE_WAKE_OUT	Connected to pin 11	2 (AWG20)
16	NA		2 (AWG20)
17	CAN_BAUD_RATE	Open – 500 kBit; Grounded – 250 kbit	2 (AWG20)
18 - 23	NA		



## Cooling

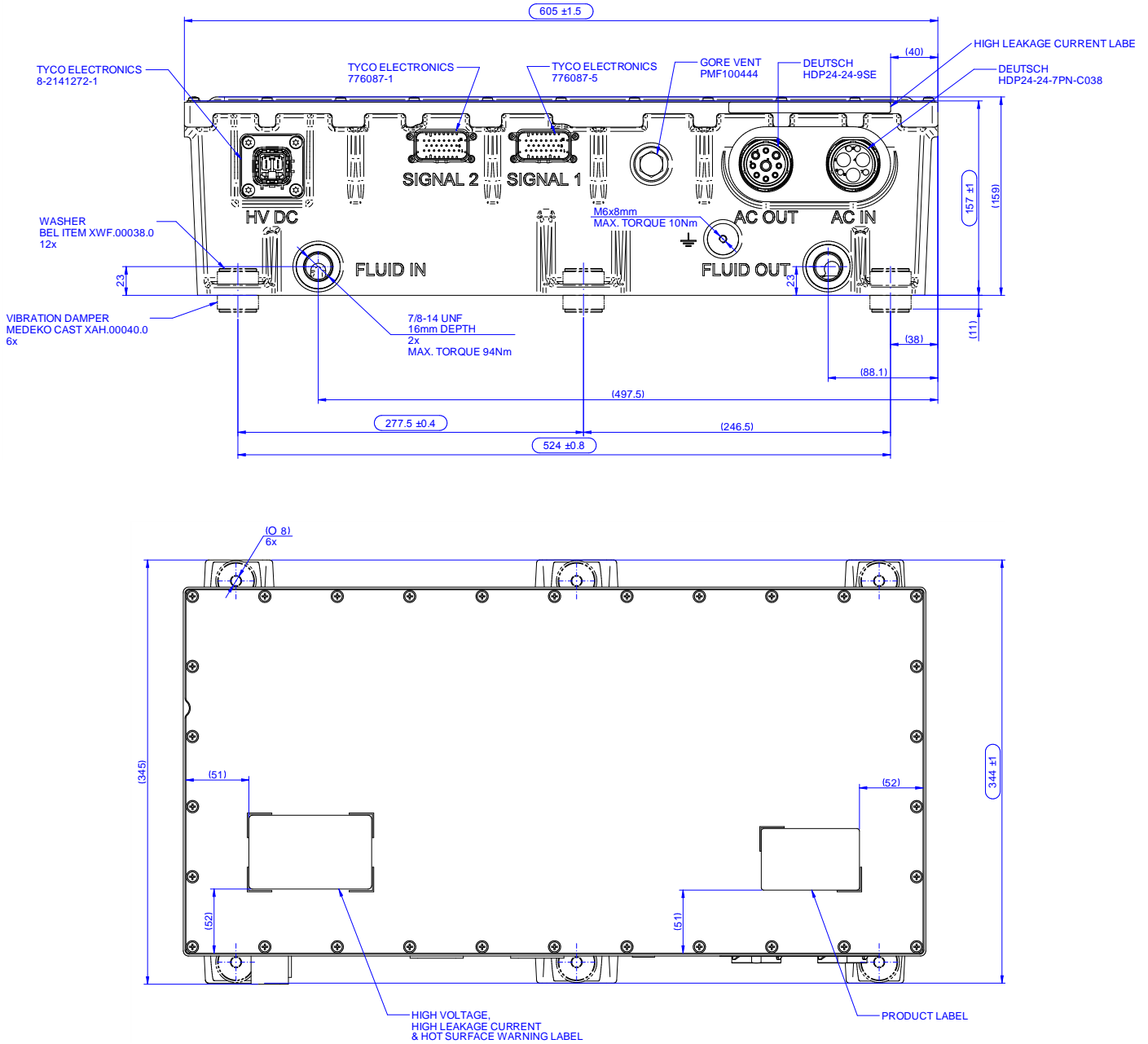
PARAMETER	DESCRIPTION / CONDITION
Cooling Type:	Liquid cooling
Coolant Medium/Mixture:	50/50 Glycol/Water
Coolant Flow:	Min. 11.4 LPM
Max. coolant pressure:	15 psi
Max. pressure drop:	3 psi
Inlet/Outlet Coolant Connection:	SAE fittings with outer thread 1-14UNS for internal hose size >=5/8" (e.g. Parker p/n: 10F5OMLOSS)
Material of fittings:	Stainless steel
Fittings provided with inverter charger:	2pcs Parker p/n: 10F5OMLOSS or equivalent

## Mechanical Specifications

PARAMETER	
Dimensions (W x H x D)	605 x 160 x 344 mm
Weight	36 kg
Enclosure Material	Aluminum alloy

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## Mechanical Drawings



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